



The 1990s Warming in the North Atlantic Subpolar Gyre in Hindcasts of the MiKlip Decadal Prediction System

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The oceans and their multiyear variability are a crucial factor for decadal predictions. The focus of the presentation is on the observed shift in the sea surface temperature (SST) of the North Atlantic subpolar gyre during the 1990s from cooler conditions in the preceding decade to warmer conditions thereafter. This increase of up to 1°C is linked to changes in the mean climate over the North Atlantic region. Therefore, it is a suitable test case for decadal prediction systems.

We examine, whether ensemble predictions from the German decadal prediction system MiKlip reproduce the shift in SST and the associated impacts on the mean conditions of temperature, sea level pressure and precipitation. The MiKlip-system is based on the coupled atmosphere-ocean general circulation model ECHAM6/MPI-OM. Ensemble predictions from four versions of the system are analyzed. They differ in resolution, in the assimilated data for the initial conditions and in the initialization scheme. A variety of reanalysis and observational data sets are used for verification to account for uncertainties in the reference data.

The initialized decadal predictions reproduce the shift in the 1990s of about the right amplitude at different lead times while the uninitialized simulations produce a cooling of the subpolar gyre. Compared to observations, the region with the strongest warming in the North Atlantic is located too far to the east and the warming hole is too narrow and shifted northwards. The observations show an associated pattern in the Pacific SST which resembles a la Nina-like pattern or a cool phase of the Pacific decadal oscillation. This Pacific pattern is reproduced by the MiKlip-system, but not in all ensemble predictions.